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DEPT. OF NATURAL RESOURCES
SOUTH PUGET SOUND REGION

JUN 18 1993

June 16, 1993

RECEIVED

Washington Department of Natural Resources
South Puget Region
28329 SE 448th Street
PO Box 68
Enumclaw, Washington 98022

Attention: Mr. Warren Warfield

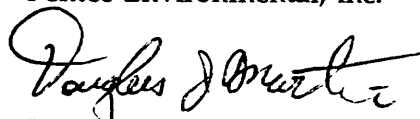
Tolt Watershed Analysis Public Works Module

Dear Mr. Warfield:

Forms hh-2 and hh-3 were not included in the Water Supply and Public Works module report because the vulnerability calls for peak flow and coarse sediment were based on tables hh-1 and hh-3 from the Watershed Analysis Manual Version 1.1. Forms hh-2 and hh-4 are only used if the vulnerability calls are modified. Vulnerability was determined for turbidity, dissolved organic carbon, nutrients, and forest chemicals, which are not addressed in Version 1.1. The basis for these calls is clearly described in the module report dated April 14, 1993. These are not modifications because the current method does not provide a procedure for identifying vulnerability for these parameters.

Please call me at (206) 775-4682 if you need further clarification.

Sincerely,
Pentec Environmental, Inc.



Douglas J. Martin, Ph.D.
Public Work Module Leader

DJM/rc

cc: T. Larkoski, Weyerhaeuser

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**Tolt Watershed Analysis
Water Supply and Public Works
Module Report**

Prepared for:

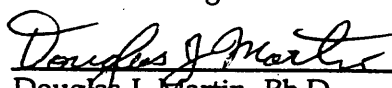
**Weyerhaeuser Company
Cascade Area
31002 Chinook Pass Highway
Enumclaw, Washington 98022**

Prepared by:

**Pentec Environmental, Inc.
120 West Dayton, Suite A7
Edmonds, Washington 98020**

April 9, 1993

This report was prepared in accordance with
Standard Methodology for Conducting Watershed Analysis
Chapter 222-22 WAC, Version 1.10
Washington Forest Practice Board


Douglas J. Martin, Ph.D.

Module Leader

4/9/93
Date

TOLT WATERSHED ANALYSIS

WATER SUPPLY AND PUBLIC WORKS MODULE REPORT (Douglas Martin, Pentec Environmental, Inc.)

Vulnerable public works were identified by review of USGS maps, FEMA flood hazard maps, and King County flood hazard assessment report. Discussions and input were received from personnel of King County Surface Water Management and the Seattle Water Department. In addition, input was received during the presynthesis meeting held on February 24, 1993. The results of these interviews are recorded on Forms hh-1 (attached). The vulnerable public works, their location, and the level of vulnerability are shown on the map overlay (1:24,000 scale) for public works and in the following tables.

Vulnerability of Public Works In the lower mainstem Tolt River.

Parameter	Facility	Vulnerability
Peak flow	Tolt River Road Section A	High
Peak flow	Tolt River Road Section B	Low
Peak flow	Tolt Bunker Road Section A	High
Peak flow	Tolt Bunker Road Section B	Low
Peak flow	Railroad (foot) bridge	High
Peak flow	Levees A and B	High
Coarse sediment	Tolt River Road Section A	High
Coarse sediment	Tolt River Road Section B	Low
Coarse sediment	Tolt Bunker Road Section A	High
Coarse sediment	Tolt Bunker Road Section B	Low
Coarse sediment	Railroad (foot) bridge	High
Coarse sediment	Levees A and B	High

Vulnerability of the South Fork Tolt domestic water supply.

Parameter	Vulnerability
Turbidity (> 5 NTUs)	High
Dissolved organic carbon (DOC > 2 mg/L)	High
Nutrients	High (not a forest management problem)
Forestry chemicals	High (toxic chemical use prohibited)
Coarse sediment filling of reservoir	Low (pertaining to reduced reservoir design life)
Timing of water inflow to reservoir	High (not a forest management problem)

In addition to the five management input factors (i.e., coarse and fine sediment, peak flow, temperature, and large woody debris), dissolved organic carbon (DOC; referred to as DOM/THM on the overlay map) was identified as a new input factor that could have significant effects on water quality for the Seattle water supply. DOC combines with chlorine during water treatment to form disinfection byproducts (DBPs). Primary among these DBPs are a family of compounds called trihalomethanes (THM), which are known to have a carcinogenic risk. DOC is derived from the natural biological breakdown of organic matter in surface and ground water sources. Forest management may influence the amount of DOC in surface and ground waters by affecting terrestrial inputs of organic matter from riparian vegetation and logging slash, and by affecting the quantity of organic matter available for decomposition on the forest floor. Forest management prescriptions that can reduce the input of DOC will help the water department control the formation of THM and other DBPs in the water supply.

The water supply is also vulnerable to nutrient enrichment and forest chemicals, but the potential for a problem has been eliminated. Fertilizers and forest chemicals are not being used nor are they planned for use in this watershed. The potential for nutrient enrichment by erosion is not a significant problem because of the naturally low productivity of streams in this area.

In the lower mainstem Tolt River, there was a concern for peak flows and flooding impacts on homes. A small flood (2-yr event) may cause flooding of some homes and portions of county roads. Large woody debris may affect the levees and the old railroad bridge in these reaches.

A Bonneville Power Administration transmission line crosses the lower Tolt River several miles above the mouth (see map). This line was not considered to be vulnerable to timber blowdown because of its height and routine vegetation management in the corridor.

The Seattle Water Department pipeline and regulation reservoir were identified as potentially vulnerable public works. The pipeline was considered vulnerable to cracking because of heavy truck traffic on the pipeline road. No potential impacts for the five forest management input factors were identified.

The proposed water supply diversion (planned for the year 2003) on the North Fork Tolt (see map) would be highly vulnerable to peak flows, coarse sediment, fine sediment (turbidity), and DOC.

The proposed water filtration plant (planned for 1998) is designed to provide treatment for current turbidity levels. If the average storm event turbidity levels increase, it would result in higher levels of treatment that could require redesign and increased cost of the treatment system. Therefore, the proposed filtration plant would be highly vulnerable to turbidity.

The proposed hydroelectric power plant (planned for 1994) that would be driven by water from the water supply pipeline was not considered to be vulnerable to any of the five forest management input factors. Turbidity may affect plant equipment, but no more concern is needed than is already identified for the water supply.

Form hh-1. Water supply assessment interview

Person Interviewed Sandy Donnelly, Katherine Lynch Representing Seattle Water Department

Address _____ Date Interviewed February 24, 1993

Phone # (206) 684-7935

Specific experience in watershed being analyzed? (Y/N)

If yes, detail.

Water quality specialist for Water Department.

Are water supply diversions present? No, but planned for 2003.

Where are the diversions located?

Proposed 8-ft high by 96-ft long weir at R.M.5.9 on North Fork Tolt River.

What is diverted water used for?

Seattle Water Supply

Is diversion sensitive to fine sediment inputs?

Yes, turbidity > 5 NTU eliminates use of water supply. Proposed filtration plant (1998) would raise turbidity threshold to 10 to 15 NTU, but this plant will need to be expanded if diversion is built.

Is diversion sensitive to coarse sediment inputs?

Yes, proposed impoundment is < 1 acre and would be subject to filling by bed load movement.

Is diversion sensitive to temperature increases?

No, except if temperatures exceed ambient conditions.

Is diversion sensitive to changes in flow?

Yes, if flows cause scour at diversion facility.

Is diversion sensitive to nutrient inputs?

Yes, but not expected to be a problem due to low productivity of river.

Are any fish hatcheries located in the watershed? No.

Additional comments?

Diversion is highly sensitive to particulate and dissolved organic carbon.

Form hh-1. Water supply assessment interview

Person Interviewed Sandy Donnelly Representing Seattle Water Department

Address _____ Date Interviewed February 24, 1993

Phone # (206) 684-7935

Specific experience in watershed being analyzed? (Y/N)

If yes, detail.

Water quality specialist for Water Department.

Are water supply diversions present? Yes.

Where are the diversions located?

South Fork Tolt Reservoir.

What is diverted water used for?

Seattle Water Supply

Is diversion sensitive to fine sediment inputs?

Yes, turbidity > 5 NTU eliminates use of water supply. After installation of new filtration plant (1998), the effective turbidity limit will be 10 to 15 NTU.

Is diversion sensitive to coarse sediment inputs?

No, except for effect on reservoir filling and reduced design life.

Is diversion sensitive to temperature increases?

No, reservoir affects water temperature.

Is diversion sensitive to changes in flow?

No, but timing of flows in fall causes erosion and turbidity from scour of river delta sediments.

Is diversion sensitive to nutrient inputs?

Yes, but not expected to be a problem due to low productivity of water in reservoir.

Are any fish hatcheries located in the watershed? No.

Additional comments?

Diversion is highly sensitive to dissolved organic carbon.

Form hh-1. Water supply assessment Interview

Person Interviewed Susan Perkins Representing King County Surface Water

Address Seattle Date Interviewed February 24, 1993

Phone # (206) 296-8091

Specific experience in watershed being analyzed? (Y/N)

If yes, detail.

Conducted County flood hazard assessment.

What public works is interviewee familiar with? County roads, levees, and bridges.

Where are the public works located?

Within FEMA 100-year floodplain in lower river Segments 1 and 2 of lower mainstem Tolt River.

Are the public works being used/maintained?

Yes, roads provide access to private homes on floodplain.

Are they sensitive to changes in peak flows?

Yes, aggradation in channel has made the reach highly sensitive to peak flows. A 2-year event will cause flooding of some portions of the County roads.

Are they sensitive to mass wasting?

No.

Are they sensitive to coarse sediment inputs?

Yes, the rate of channel migration is directly related to the amount of coarse sediment deposition.

Additional comments?

Large wood debris may affect levees and old railroad bridge.

Dissolved organic carbon in South Fork reservoir and tributaries during 1992.

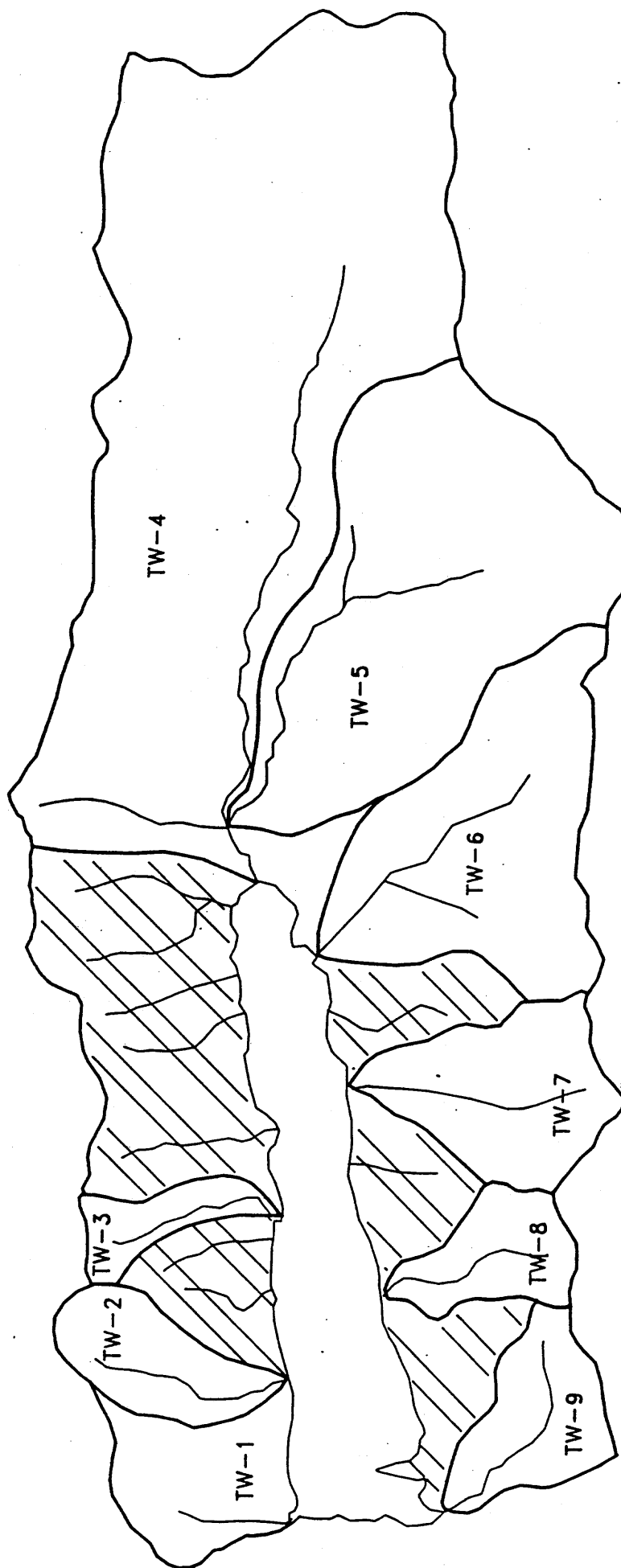
Station (Lake)	Depth (m)	Concentration (mg/L)					Basin area (acres)	Runoff (acre-feet)	Total DOC Load	
		29-Jul	19-Aug	9-Sep	2-Oct	22-Oct			(kg)	(percent)
2-A	2	1.91	1.5	1.37	0.91	1.54	1.51	1.46		
2-C	15	1.98	1.36	0.98	1.04	1.51	1.56	1.41		
3-A	2	1.91	1.36	1.31	0.93	1.52	1.68	1.45		
3-E	25	1.71	1.19	1.65	0.79	1.59	1.67	1.43		
4-A	2	1.99	1.19	1.47	0.86	1.5	1.77	1.46		
4-G	25	1.77	1.16	1.06	1.81	0.95	1.73	1.41		
Mean	11.83	1.88	1.29	1.31	1.06	1.44	1.65	1.44		
(Tribs.)										
TW-1		3.36	2.13	9.03	0.89	8.38	3.53	4.55	1825.34	10247.95
TW-2		2.43	1.67	10.1	0.73	8.85	1.64	4.24	1917.84	10018.45
TW-3		1.53	1.06	4.57	0.68	0.92	0.81	1.60	1005.17	1976.81
TW-4		1.52	0.72	4.2	0.85	3.73	0.82	1.97	22557.79	54885.81
TW-5		1.45	0.63	1.73	0.91	2.66	1.47	1.48	10927.39	19873.38
TW-6		1.65	0.72	6.62	0.88	5.95	2.65	3.08	6567.54	24927.64
TW-7		1.99	1	6.29	1.43	5.18	0.95	2.81	3299.18	11417.22
TW-8		2.47	1.55	9.52	1.28	8.82	3.96	4.60	1603.34	9093.84
TW-9		2.15	1.65	10.1	1.01	8.95	3.3	4.53	2115.18	11805.61
Mean		2.06	1.24	6.91	0.96	5.94	2.13	3.21		
Unmeasured								3.21	12832.90	50791.73
Total							10484	64651.68	205038.43	100.00

SOUTH FORK TOLT RIVER

LEGEND

TW-X = MEASURED BASINS

▨ = UNMEASURED BASINS



Total Trihalomethane Concentration

Tolt Source at Location B-4

